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THE MODERN TERMINAL PORT

BY WILLIAM JOSHUA BARNEY,

Consulting Engineer, New York City.

Efficient terminals are today essential to social and economic advancement. Among railroad men, the great problem of transportation is the cost and speed of handling goods through the terminals. On the main lines of the great railroads, little improvement can be made for speed and economy. Millions, therefore, are being spent by the railroads to make their terminals more convenient and efficient for passengers and freight.

All the great ports on the continent, from Montreal all the way round to Seattle, have paid out large sums of money to experts to plan their terminal ports. They have spent millions in construction—much of which has been expended to modernize and to correlate existing piers, sheds and waterfront railroad yards. On every hand, corporation and public authorities are beginning to concentrate brains and capital on the problem of the modern terminal.

The "modern terminal port" may be defined as "a terminal of terminals" and is a more inclusive term than "The modern terminal." The latter phrase is too often limited by custom to a railroad terminus, whereas the terminal port involves the designing and constructing of piers, bulkhead, wharves, pier sheds, warehouses, mechanical equipment, lighting, heating and also railroad tracks and yards, and railroad equipment in all its complexities. In generalities, it requires wide and experienced imagination for the proper planning of future facilities, tempered by a proper sense of proportion as to financial and commercial expectation. In administration, it demands tact and executive ability to adjust and correlate existing enterprises, and to bring many varied interests into one harmonious whole.

This science of creating terminal ports is in its infancy in this country. Its principles are known to a few, its importance realized by a moiety. Its literature is comprised in random articles and papers before societies. It is a science, therefore, to advance

which will pay the individual by its very scope and by its opportunities to contribute to its literature and recognition. A study and dissemination of its principles and importance should appeal strongly to municipal and national patriotism. Many of our ports—sea, lake and river—are having but a tithe of their full prosperity, because their citizens fail to realize that antiquated wharves, uncorrelated with the railroads, strangle growth in wealth and population. In contrast, the modern prosperity of Hamburg, Liverpool and New Orleans is resultant from their terminal ports, the existence of which is largely due to the energetic realization by their citizens of the necessity for such terminal organization. The people of a city must be in insistent accord with terminal development for it to advance effectively—and authoritatively informed leaders are needed to create this popular accord and understanding.

The old simile that transportation ways are the arteries of a civilized state should be carried further to emphasize that the terminals of transportation, especially waterfront terminals, are the heart centers. Even with the best of arteries, if these heart centers are clogged, there is an unwarrantedly slow and costly circulation of freight and food supplies. Viewed from this angle, the terminal organization of the city becomes of utmost importance to the economist and social worker. In fact, bad terminals are prime contributors to the high cost of living, since they result in confused masses of freight passing in and out of the city at exorbitant cost in time, labor and money.

For example—a truck farmer of Staten Island, one of the boroughs of Greater New York, leaves his farm before midnight to drive slowly into the great wholesale district along Greenwich Street on the lower west side of Manhattan. He arrives there early in the morning and disposes of his produce and returns home. That evening is placed on his neighbor's table some of the same food so laboriously taken to Manhattan in the morning, for the local grocer has followed behind the farmer some four or five hours later, purchased his vegetables from the wholesale man in Manhattan and brought them back to Staten Island. Food cannot be moved ten or fifteen miles and returned without someone having to pay for the unnecessary hauling.

This condition obtains for practically all the great city of New

York. Through trade customs, prestige and organization, practically the entire wholesale food business of New York, save meat and fish, is contracted into a few blocks in the lower west side of Manhattan. To this center all food supplies are trucked, usually under crowded and congested conditions, and are likewise trucked away to the various retail dealers, many of whom are located only a few blocks away from an original point of entry for such supplies.

This problem of sub-dividing the market center is now engaging much attention in New York; and unquestionably, at no distant date, the Bronx, Brooklyn, Queens and Staten Island will be provided with their own market terminals, served by direct railroad connection and by lighters and small crafts. Such rearrangement of market facilities provides an excellent opportunity to introduce modern sanitation, both in the construction and inspection, which is sadly lacking in the markets of most American cities.

Practically every city thus illustrates, in one way or another, how directly poor terminal arrangements affect the cost, comfort and sanitation of living. Therefore, when studying a city and its life, the student of theoretical economy or the direct worker for social betterment should first look into the terminal conditions, for in them only too often will be found the source of the community's economic and sanitary problems. The science of terminal planning thus becomes a touchstone of great value to the economist and sociologist. To this end let us consider the elements and the characteristics of the modern terminal port.

Reverting to the first definition of a terminal port, "a terminal of terminals," there are two phases to consider—first, the individual terminals of a port which may be based on one pier or many; second, the interrelation of these individual terminals in forming one composite whole.

The individual terminals may be advantageously classified with reference to the origin and destination of the goods or freight passing through them. In these classifications, as in grouping generally, clear-cut lines of division are assumed for discussion, but do not occur in reality, since practically all classes of goods in small or great quantities will pass through every terminal. One type, however, usually so predominates that the terminal may be placed.

First, there is the trans-shipping or import-export terminal.

Such a terminal is primarily a point of interchange between the railroads, river crafts, coastwise steamers, and oversea ships. Goods are received from all parts of the country, assorted and assembled into cargoes for export; in the same manner cargoes from abroad are unloaded, classified and distributed throughout the country.

The characteristic of the trans-shipment terminal is that it forms a community or center of business, that may be, in fact should be, located in the outlying sections of the city, since the freight there handled is not destined for the city proper: for example, Tillbury Docks, some eight miles below London, or the trans-shipping sections of the great terminal companies in the outlying sections of New York.

In the second class of waterfront terminals is placed the industrial terminal. Through this type of terminal, raw goods pass into the city to be manufactured, and the finished articles pass out. In its highest form, such a terminal is really an industrial area fed by railroads at the rear and by vessels on the waterfront. This terminal requires a larger space than the trans-shipping terminal for its proper development and has a closer relation to the city activities, since the many people employed in the factories and warehouses require homes adjacent; and the salesrooms and general offices of the industrial concerns should be convenient to the general public.

The third type of terminal, the city terminal, is more intimately involved in the life of the city than the industrial terminal. Through the city terminal are handled the articles for daily consumption, such as foodstuffs, and for local use, such as building materials. On the waterfront, such a terminal should be located close to the heart of the wholesale and retail districts, and should provide facilities both for large and small crafts; and should have trunk line connections to its switching tracks and sidings.

In a fourth class is the city-railroad terminal. At most ports it is possible, in a large measure, to separate the local railroad service from the local waterfront service. Thus the shore front and adjacent areas are not preempted or congested by railroad yards and freight yards, which may be well placed to the rear or landward side of the city. In fact, these railroad terminals for **handling city-railroad freight** should only intrude upon the water-

front under peculiar conditions, such as obtain at New York and San Francisco.

Another type of terminal, not existing in this country, is the free port. A free port is in a protective country and comprises a definitely bounded shorefront and adjacent upland which is regarded as foreign territory in respect to the imposition of tariff duties. Its waterfront is a port where freight from the protected hinterland and from abroad may be assembled for trans-shipment to foreign countries without custom inspection or payment of duties. Its upland is an area, separated from the protective country by definite custom barriers wherein raw materials and products from inland and abroad may be gathered and manufactured for exportation to foreign markets without custom supervision and charges.

Merchandise and raw materials may enter a free port of the protective country from any direction without custom restraint; but can leave free of duty only for foreign territory—unless previously entered into the free port under a drawback. Goods crossing the custom barrier into the protective hinterland must pay duty as though the shipments were from territory actually foreign. A free port, therefore, combines in reality the characteristics of the trans-shipping and of the industrial terminal, but isolated by custom restrictions and with the necessary physical barriers to enforce the same.

Lastly, there are the terminals for passengers which in reality are another form of freight and a form that has an influence out of proportion to its importance, especially in marine terminals. In our larger cities the railroads have separated their passenger and freight stations, placing the former as close as possible to the center of the hotel, shopping and commercial life; the latter, in outlying and less valuable sections. Unfortunately the separation of passengers and goods is not practical in marine transportation;—except under the rare conditions obtaining at Liverpool, where passengers are discharged at a landing stage and the vessel then warped into a dock for the handling of cargoes. For physical and financial reasons passengers and freight must usually be landed at the same wharves. The passenger is constantly insisting that the landing be nearer and nearer to the center of the city, whereas the efficient and economic handling of the cargoes may require outlying or

trans-shipping terminals. In this conflict, unfortunately, the passenger freight has frequently prevailed over the inanimate cargo with consequent congestion and higher costs to the city and country in order to save its passengers a few minutes' inconvenience or delay.

A terminal location is often selected because the land is cheap or has features that permit less costly construction; yet the location so chosen frequently imposes a permanent tax on the community by unnecessarily high handling charges because no consideration was given to the class of freight to be handled, or frequently the same results are imposed by the growth of the port. Therefore the classification of terminals with regard to the origin and destination of goods is a valuable guide to the investigator in analyzing the advantages and drawbacks of a terminal port, or to the expert in planning future facilities.

With the location of the terminal analyzed, the plan or arrangement for the terminal itself may be considered. In all plans for the various terminals are found practically the same features, wharves, transit sheds, warehouses, railroads, tracks, mechanical equipment, etc., but varied and emphasized to meet the conditions and requirements of the particular terminal.

In this country with moderate rise and fall of tides, the shore-front, has been improved under two general schemes: the first, the pier and slip plan; the second, the quay plan.

In the first system, wharves, termed piers, are built from the bank into the fairway or stream with water slips or artificial inlets between them, in which the ships lie along the wharves while discharging their cargoes. The shorefront proper from which the piers spring is usually retained by a bulkhead. The great attraction of this system is that, for a given length of shore front, the lineal feet of wharfage or berthing space may be greatly increased. It has therefore been generally adopted in ports where the area of the harbor, or the width of the stream, is sufficient to permit these projecting piers without narrowing the fairway or channel so much as to interfere with the ready and safe handling of vessels.

On the other hand, piers and slips have certain disadvantages. Frequently in the desire to obtain a larger ratio of wharfage to shorefront, piers are made too narrow for their length, which results in costly congestion in the handling of freight. All freight

handled between the pier and the mainland must pass in and out of the door or doors at the shore end of the pier, which in too narrow a pier, like the neck of a bottle, prevents rapid handling of freight. This pier congestion has been avoided in modern designing by making the piers of ample width, two hundred and fifty feet to three hundred feet for large vessels. The central strip of such a pier is usually reserved as an open driveway or street. The pier thus becomes, in fact, a projecting quay. If the tidal movement or the stream current is very swift, it becomes difficult for vessels to warp in and out of the slips. However, practically all the great ports of this country, except New Orleans, are developing under the pier and slip plan.

The quay system of improvement has been extensively followed by river ports, our most important example being New Orleans. In a quay development, the natural shorefront is retained by bulkhead walls forming quays, and the ship lies parallel with the shorefront, instead of at various angles as under the pier and slip plan. There is thus little projection of structure or traffic into the stream which is therefore fully available for the navigation of vessels. For this reason, the quay system is particularly advantageous for terminals along narrow fairways.

The movement of freight across a quay is less crowded and more rapid than the movement of freight down a pier. Cargoes landed on a quay and placed under a shed or open platform may be removed by railroad cars or trucks at many points along the back of the shed or platform without congestion. In other words, the quay movement of freight is lateral and direct from the ship to the hinterland, whereas, on a pier, the movement of freight is always at right angles from the ship along the pier; and, in distribution, goods must all pass through the one exit.

The type of shed placed upon the pier or immediately along the quay is governed largely by the class of terminal or of freight handled. Where the sheds serve merely as temporary coverings for merchandise which is rapidly sorted and delivered, the shed may be one or two stories—in fact, as at Antwerp, may be merely open sheds or roofs to keep off the rain. On the other hand, where goods are to be assembled to accumulate cargoes, it is desirable to increase the direct waterfront storage, and frequently three-, four-, six- and even eight-story warehouses are placed immediately along

the wharf front as instanced by the new warehouses at Rotterdam and Manchester. Frequently much expense in handling goods could be avoided by having available such waterfront storage, instead of requiring, as is common in our American ports, the cargoes to be landed at a wharf and then removed with several handlings to storage houses located two hundred feet to four thousand feet inland.

As to the location of railroad tracks on the wharves, there is much difference of opinion, largely due to local traditions and the failure to recognize that an arrangement efficient in one terminal for certain goods will not answer in another though adjacent terminal where a different class of freight is handled. For example, in the trans-shipping or import-export terminal where there are large movements of bulk freight directly between the railroads and the steamers, unquestionably part of the tracks, at least, should be located directly along the edge of the piers or quays, and cranes or tackle masts provided for the rapid interchange of freight between the cars and the steamer.¹ On the other hand, in city terminals where the land movement of freight is largely by trucks, railroad tracks should be relegated to the convenience of the trucks and placed in the center of the pier or to rear of the quay sheds with frequent track-crossing at grade for the trucks entering and leaving the shed of the trans-shipping or general terminal. Montreal is an excellent example of an efficient pier and slip terminal; and New Orleans, of quay terminal.

In industrial terminals, goods are not to remain on the immediate waterfront longer than necessary, since the raw goods are to be rapidly taken to the factories and the finished articles shipped on delivery. Therefore, every facility should be afforded for the rapid movement of freight between the factories and their storehouses and the wharves. Clear driveways for motor trucks and pier autos should be available and railroads should be placed on the wharves only where they are real adjuncts for the quick handling of local freight. In an industrial terminal the railroad service should be provided with a local classification and switching yard

¹ Even under these conditions, the necessity of customs examination frequently tends to prevent this quick, direct interchange to such an extent that the railroad tracks are better placed behind the landing platform (or away from the pier edge) on which the customs inspection is first made. The elimination of this hindrance to direct interchange of freight between the vessel and railroad is a prime argument for free ports.

having connecting tracks to the wharves, factories and trunk lines. It is especially important that the factories have sufficient railroad sidings connected with the trunk lines, since many of the goods manufactured will be shipped throughout the country and raw goods delivered from the country at large.

Among the most striking examples of industrial terminals in this country are those on the properties of the New York Dock Company and the Bush Terminal Company on the eastern side of New York Harbor. These terminals show wharves served by railroads and backed by warehouses, and behind the warehouses, concrete factories, each served on the one side by railroad spurs and on the other accessible by streets leading to the city proper, and adjacent thereto classification yards with connections to the trunk lines. Equally prominent are the nearby modern flats for the industrial population. Such industrial centers are, in reality, model terminal cities within or adjacent to the city itself, but not so interwoven with the general city activities as to cause expensive congestion in handling in and out raw goods and manufactured articles.

It is well to emphasize here that the surest way to secure for a community permanent and rapid growth in prosperity is to encourage its industrial enterprises. Many cities, especially ports, have had their beginnings and first prosperity in serving as entrepôts. Chicago and St. Louis are striking examples of railroad centers, whose first greatness lay in their being important transshipping cities; but today the underlying wealth and prosperity of these and similar inland cities are in their great industrial enterprises. New York, from its early days, has been one of the world's transshipping centers, but New York's great growth in wealth and population is derived largely from its being the greatest manufacturing city of this country.

The factories and industrial works in these cities draw a large laboring population—requiring new homes, service, etc.—and are constantly attracting new capital—thus, the cycle of growth is assured. In contrast, Antwerp, before the war, recognized as one of the leading entrepôts of northern Europe, had a comparatively small population and without industrial enterprises was growing but slowly. Even the great port of Liverpool is being overshadowed by the industrial city of Manchester. The economist, there-

fore, should inquire carefully into the present industrial enterprises of the community and eagerly seek for means to expand them along modern terminal lines.

After this summary of the various terminals forming a modern terminal port, there is to be considered the essential for joining these terminals into "a terminal of terminals." The individual terminals must be organized and correlated into the terminal port so as to permit the rapid and cheap interchange of freight. The medium for this interchange is the connecting or belt line railroad running between the various railroad terminals, the maritime terminals and the industrial areas and also reaching into the wholesale and often the retail districts.

Mere points of contact for switching between the various railroads will not serve this purpose. Experience shows that a car starting from a railroad on one side of the city to be switched over the tracks of several other railroads to a factory or pier on the other side will be subject to numerous delays and high charges, but, if a terminal port is served by a belt line—private or public—such local transfers and interchanges are made quickly and at low cost.

The belt-line installation, therefore, is today a recognized and sought for complement of terminal development. One of the great current questions in New York is the proper method of installing such lines to link up the many terminals of this great port—thousands of dollars and years of study and many adjustments and concessions mark the steps of New York's endeavors for this necessity.

New Orleans openly lays much of her recent growth and prosperity to her excellent belt-line service. New Orleans' belt line serves the entire harbor front, taps each railroad entering the city, serves the wholesale district and is now being extended to outlying tracts of land in order to encourage the establishment of manufacturing and industrial enterprises. Of these, New Orleans has comparatively few, and her able citizens have publicly adopted the slogan that much of New Orleans' future and growth depends upon securing factories and industrial centers and that the readiest and surest means of so doing is to expand and improve the belt-line service.

In a paper before the American Association of Port Authorities, the Hon. William B. Thompson, President of the New Orleans Public Belt Line Commission, summed up the meaning of the belt-

line service to New Orleans by stating that before this installation, local switching charges amounted to from \$13.00 to \$15.00 per car with a delay in many cases of several days at least, whereas, today, the same service is rendered for \$2.00 a car flat and is performed quickly and in close coöperation with the shipper's interest. San Francisco and Montreal emphasize what New Orleans teaches; likewise, St. Louis, Cleveland and many of the inland cities show great advancement in prosperity from the dates of their private belt-line installations. Practically none of the great foreign terminal ports in the cities of northern Europe is unprovided with belt-lines. Some of these cities have gone even further, in that they provide not only engines for transferring the cars of other railroads, but provide also cars to be shipped out over the trunk lines. Local enterprises thus have no delay in securing empty cars to send out raw goods or manufactured articles.

In addition to these physical aspects, it is of equal importance, in creating the modern terminal port, to consider the organization for administration and finance, especially of the waterfront or port proper.² Experience has shown that it is both impracticable and undesirable to secure the needed correlation of piers and terminals for the modern terminal port by means of private control. If the returns on capital invested are made sufficient to admit private enterprises, port charges then become a burden on the commerce which therefore is deflected to other places. Such terminal organization frequently requires radical changes in the plan of the port and also of the city back of the waterfront, power to make which changes can be rarely delegated with safety to private enterprise. On the other hand, publicly invested capital requires a low rate of interest, especially where a community is to derive great benefits by increased commerce, increased population and increased industrial development—all of which follow closely upon a wise development of port facilities. Further, to public officials under proper control, large legal powers may be safely granted for condemnation, for the organization and operation of terminals and for other port services. These influences and the more or less unconscious realization of the above facts is bringing about a wide demand for the public administration of port facilities.

² Excerpts from author's paper on *Port Administration* before the American Association of Port Authorities.

From a broad survey of successful ports it is conclusively shown that continuity of good port policy, consistency in proper port planning and development, and properly used autonomy of port administration are the three administrative essentials for the successful upbuilding of a great terminal port.

Continuity of a good port policy gives to commercial and maritime interests a reasonable assurance that desirable conditions will continue, such as equality in charges, impartial methods of obtaining wharf facilities, similar terms for tenure of piers and wharves and a steady improvement of transportation facilities. These strongly tend to a steady growth of commerce and trade. Opinions will differ as to what constitutes a "good policy." Local traditions, trade customs and laws all tend to modify any standard pattern, but in port administration as in business management the fundamentals are honesty and impartiality.

Consistency in proper port planning and development is somewhat a correlative to continuity of port policy, yet is as essential to the successful growth. If piers are built here, there and everywhere without regard to their purpose, without the means of economic interchange of freight and no systematic provision made for future extension, congestion of the most expensive kind will inevitably result and the free circulation of traffic will be made impracticable.

Autonomy of port administration is requisite, otherwise the port revenues, which are taxes upon the commerce of the country, may be diverted to supply local needs of the seaport town; and, as is too frequently done under inefficient municipal government, so expended as to bring little returns to the community and none to the development of the port facilities. Autonomy of port affairs further means freedom from local politics and tends to insure continuity of policy which otherwise would be changed with each shift of the local government. Unless greatness is thrust upon a harbor by overwhelming natural advantages or by a peculiar combination of financial interests, experience shows that a harbor will become a great port in so far as its administration possesses the above attributes.

Continuity of port policy may be secured, first, and obviously, by a system of port government in which the officials by law or custom hold long tenure of office; second, where the general public

or citizens of the port have a thorough understanding of a correct policy and insist that it be followed. Continuity of port policy in this country has been greatly retarded by the difficulty of securing either of the above conditions. The essential principles of our form of government do not encourage long tenure of office by public officials, even in local affairs. Hence port officials, usually subordinate to municipal or state government, are constantly changing with the political vicissitudes of succeeding elections. On the other hand, the citizens in many of our ports have little direct concern or interest in the development of the waterfront. A large majority of the more influential and intelligent men have their energies directed to the development and progress of their mines, factories and railroads throughout the country and little if any of their time or thought is given to the harbor. Under these conditions a municipality is rarely, as a community, interested sufficiently to insist upon any continuity in the handling of port plans and policies. This is in contrast to many of the continental ports, whose history, growth and business center around the port activities. A large proportion of their citizens in daily business depend directly upon the success of the port for the success of their own affairs. This public interest and the traditional retention of competent officials have made many European ports, despite great natural handicaps, keep place among the great ports of the world.

Consistent and proper port planning is obviously more readily contained where port policy is stable. On the other hand, many cities whose maritime growth is patently suffering from poor administration have adopted and are developing under excellent plans, though in turn their proper physical development suffers in common with the commercial growth from inefficient or changing administration. Progress towards proper terminal development under such conditions may be slow—at times even retrogressive; but even such halting progress shows the great value and necessity for proper port planning.

Complete autonomy of port administration is not found in this country, though every element of administrative autonomy may be instanced by the administrative powers of the various American ports. One port possesses wide discretion as to public organization and operation of terminal facilities; another port

lacking in this respect is authorized to finance its improvements with almost as much power as a private corporation.

As the necessity for scientific management of port affairs is more widely realized by the public, the tendency in this country is to grant wider and more efficient power to those entrusted with port affairs. The governing officials of many British ports are already as free to act in their judgment and discretion as the officials of private corporations. Such ports as Liverpool and Manchester are strong arguments for autonomy in port administration.

These general conclusions and statements relative to port administration form suggestions to the political economist of opportunities for forceful and valuable work to be done.

Space does not permit the illustration of the general principles above outlined by a discussion of the various ports of this country and Europe. Those, however, who are interested in following up such detailed discussions may turn to the various papers by eminent port and terminal authorities published in the Proceedings of the American Association of Port Authorities.

In conclusion—the science of terminal and port planning deserves the most thorough consideration from everyone interested in advancing the social and economic welfare of our great cities; it is a science so young that it affords a wide field in which to win recognition; it needs the ablest of men to set forth its principles and to practice them and above all to arouse the citizens as to the advantage, or rather, the necessity, of appropriating money and time and confidence for terminal projects.